CANCERS APPEAR IN THE FAMILY

Grief

Acceptance

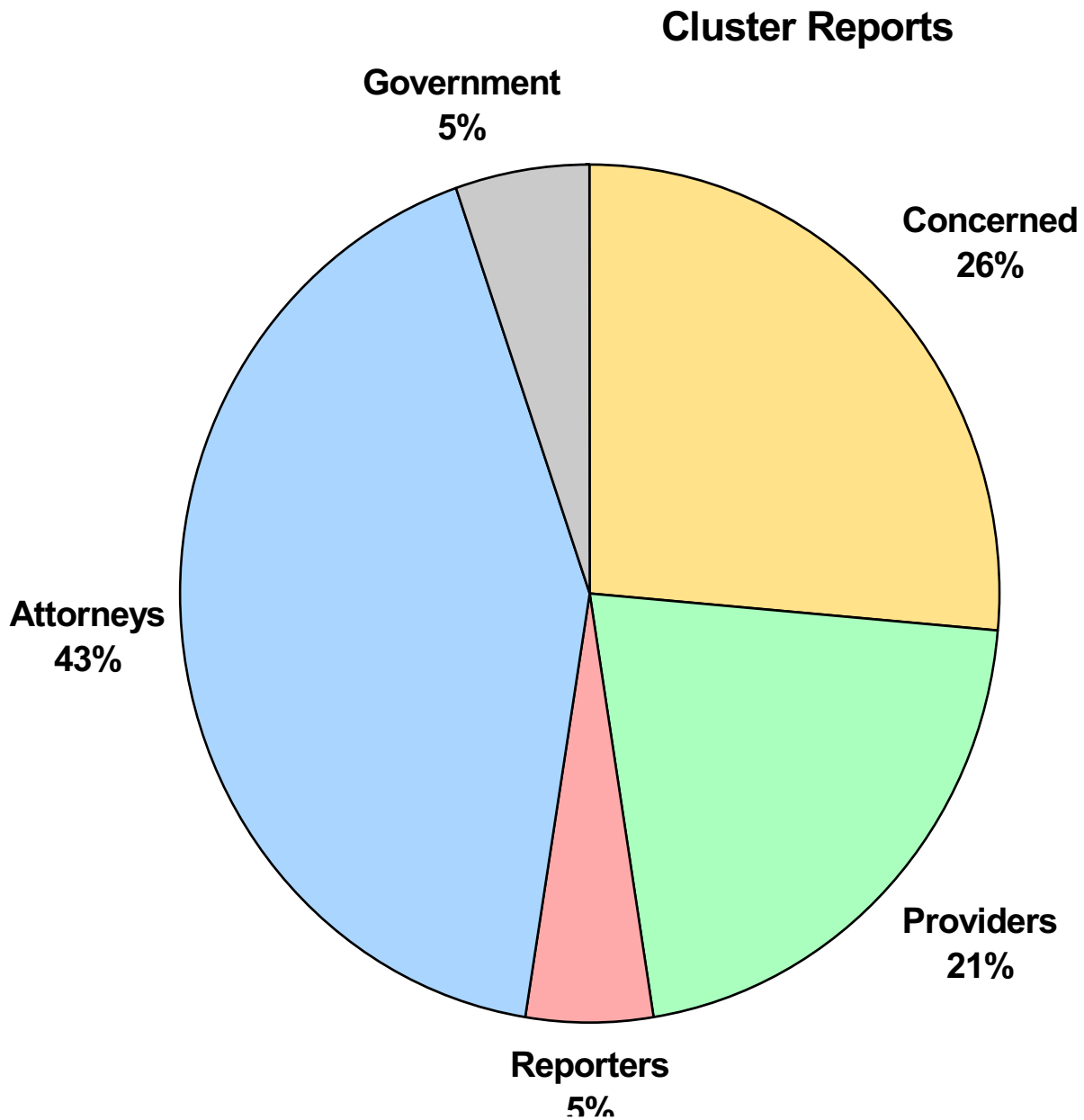
CANCERS APPEAR IN THE NEIGHBORS

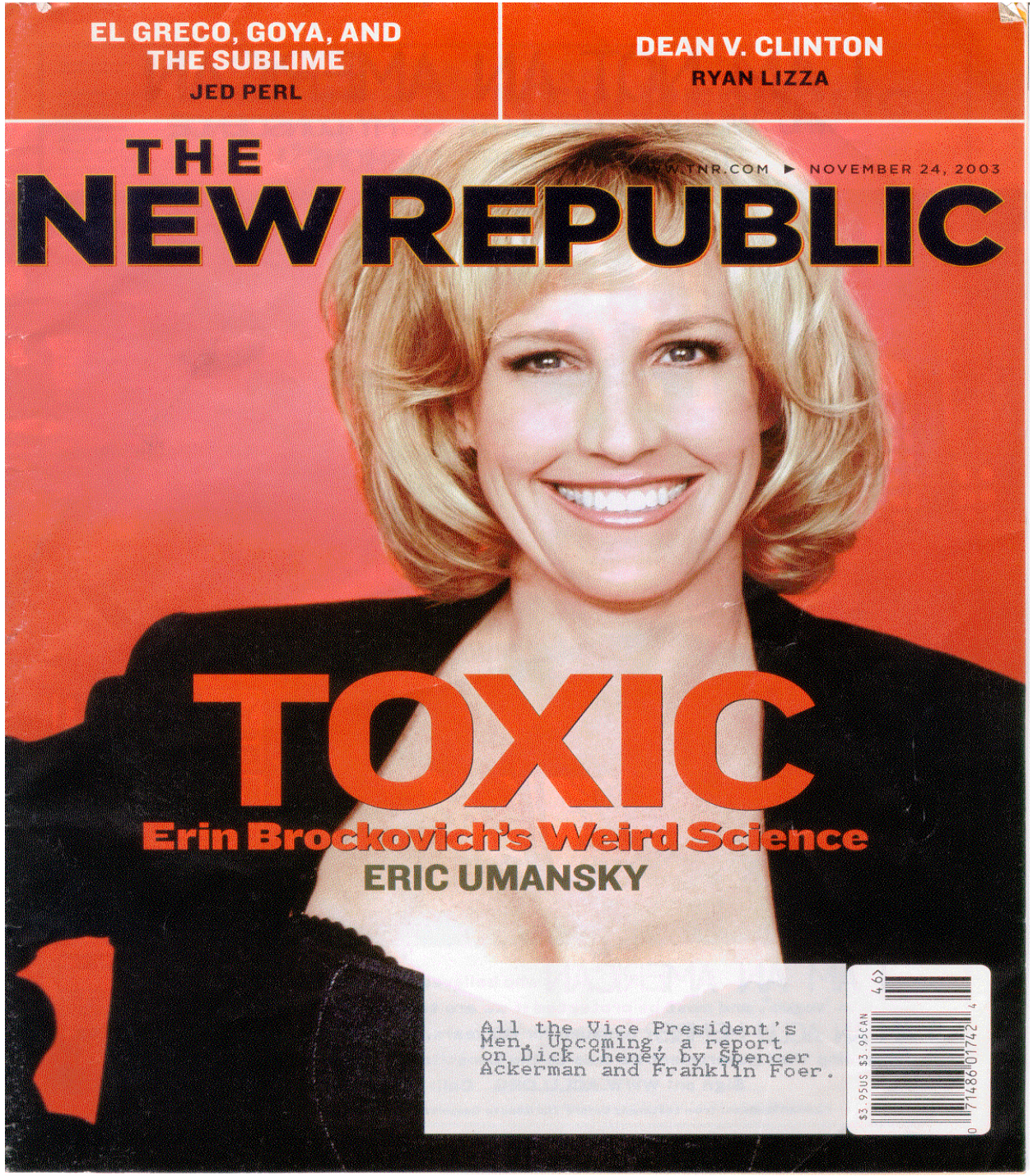
Fear

Suspicion

LAY MISUNDERSTANDINGS

- CANCER IS A SINGLE DISEASE
- MORE THAN ONE CASE IS A CLUSTER
- CLUSTERS ARE DUE TO POLLUTION
- MUST BE A NEARBY TOXIC RELEASE


Cluster Reports
Government
5%
Concerned
26%
Attorneys
43%
Providers
21%
Reporters
5%


EL GRECO, GOYA, AND THE SUBLIME
JED PERL
DEAN V. CLINTON
RYAN LIZZA
THE NEW REPUBLIC
WWW.TNR.COM ▶ NOVEMBER 24, 2003
TOXIC
Erin Brockovich's Weird Science
ERIC UMANSKY
All the Vice President's Men. Upcoming, a report on Dick Cheney by Spencer Ackerman and Franklin Foer.
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46
0 71486 01742 4

Environmental Carcinogens are Everywhere

- Hexavalent Chromium
- Methlene Chloride
- Benzene
- Trichloroethylene
- Carbon Tetrachloride
- Vinyl Chloride
- Asbestos
- Dioxins
- Polycyclic Aromatic Hydrocarbons

Two approaches to responding to this problem

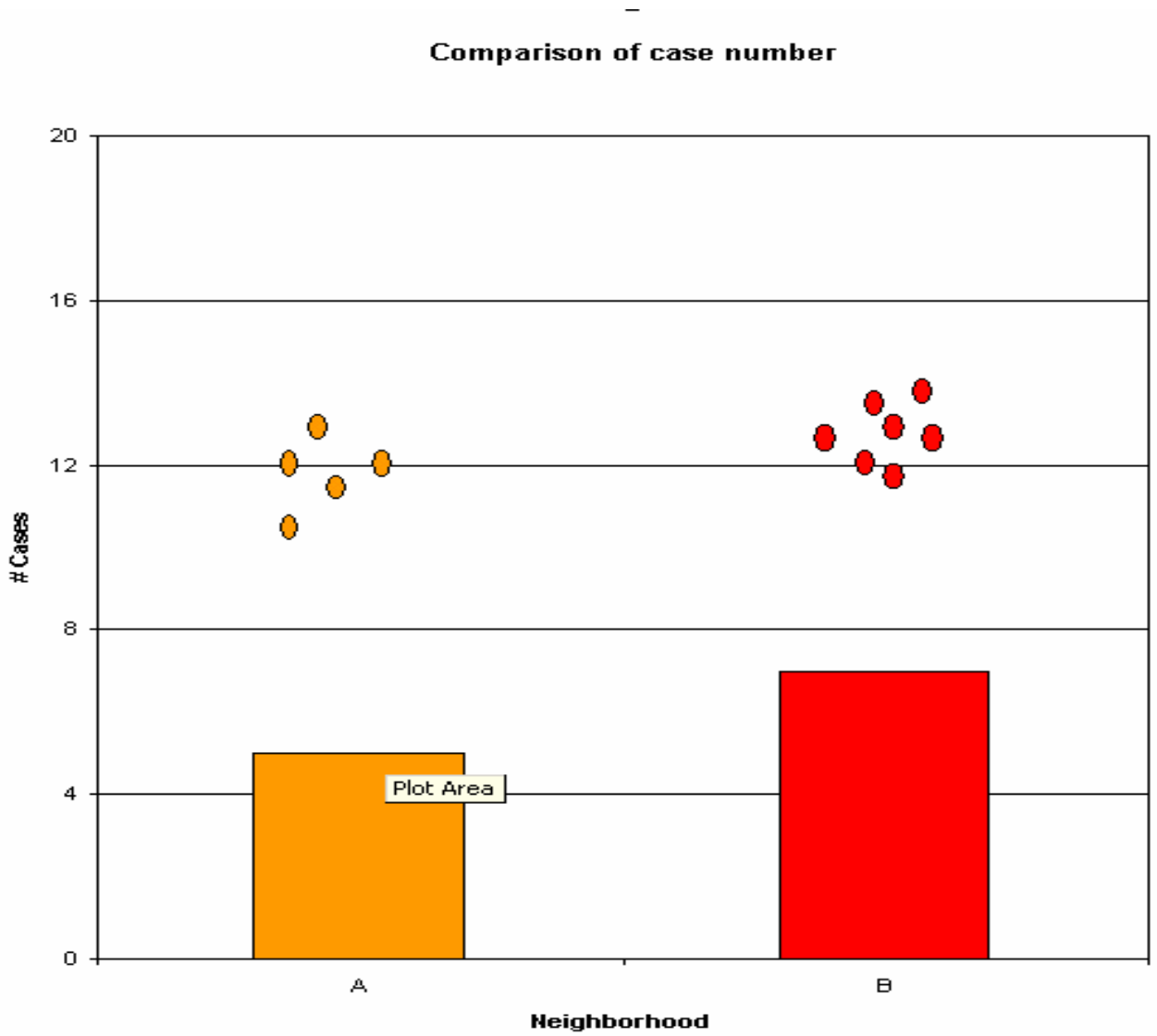
- **1. Given a carcinogenic emission, how much risk (how many cases per population) would one expect to result?**

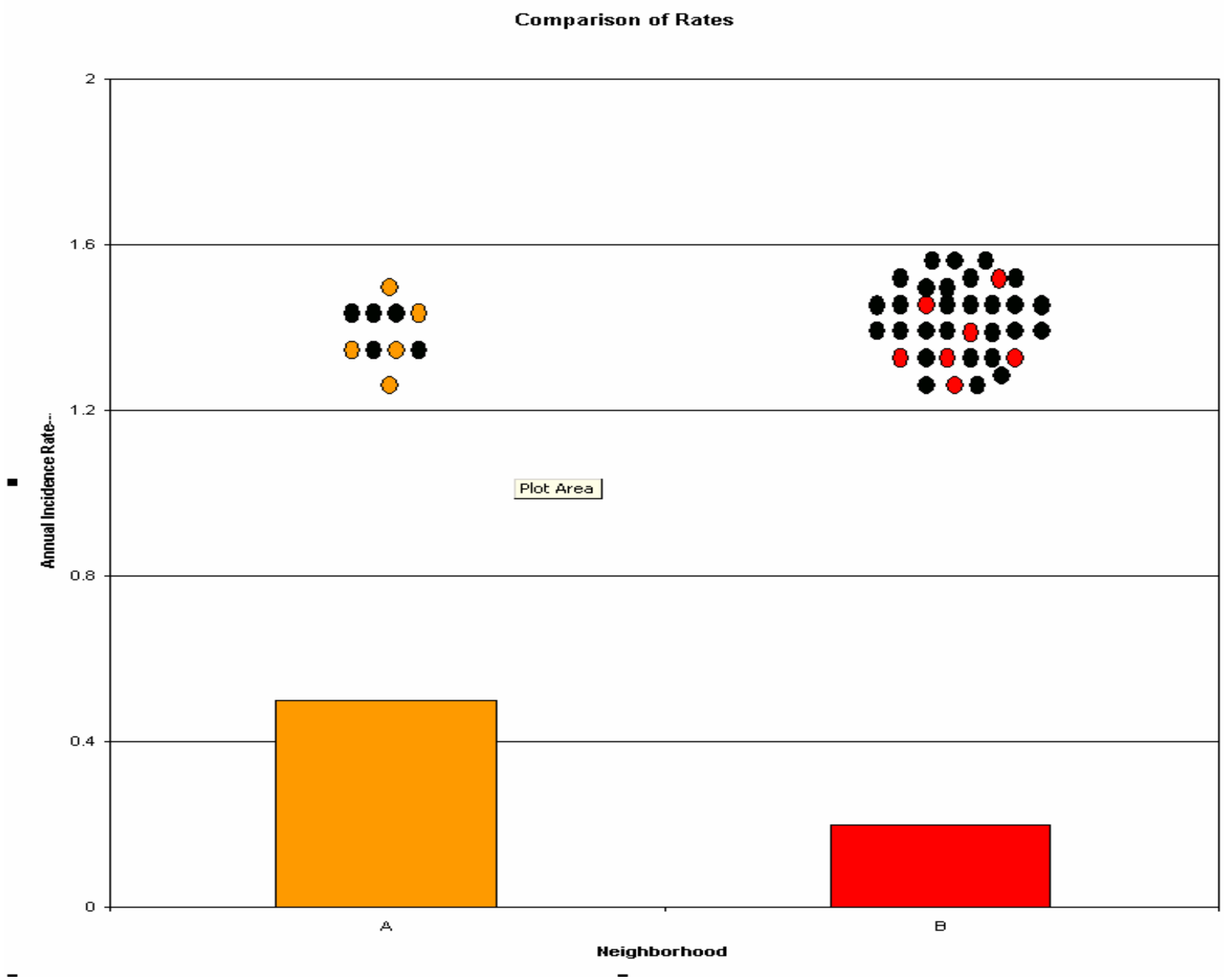
- **2. Can we see any evidence of an increased risk (an increased number of local cases)?**

How many cases would result from an emission?

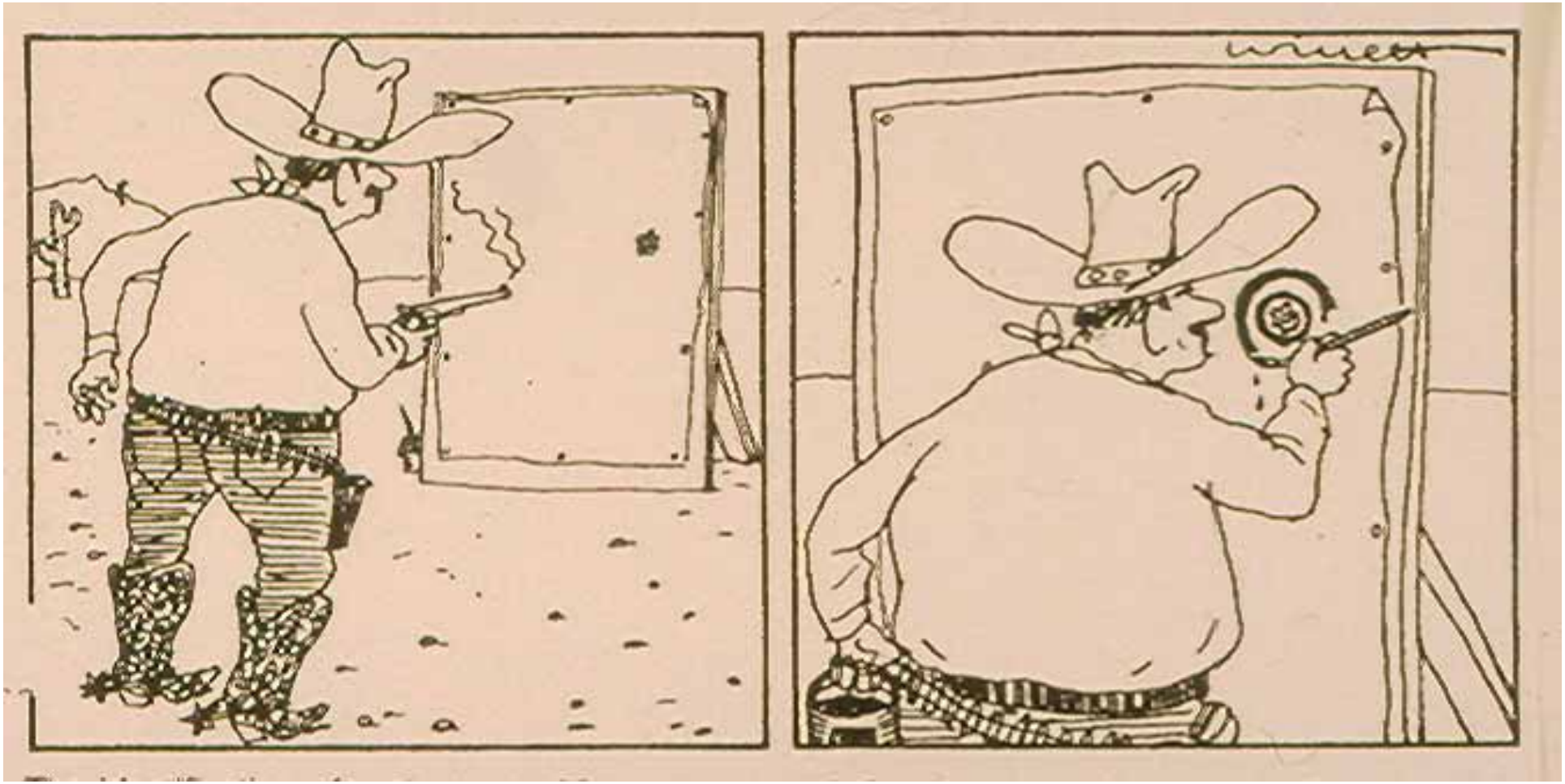
Should be easy to tell!

- Identify exposed
- Measure exposure
- Define cases
- Count cases
- Compare to baseline


Comparison of case number
20
16
12
8
4
0
Cases
Plot Area
A
B
Neighborhood

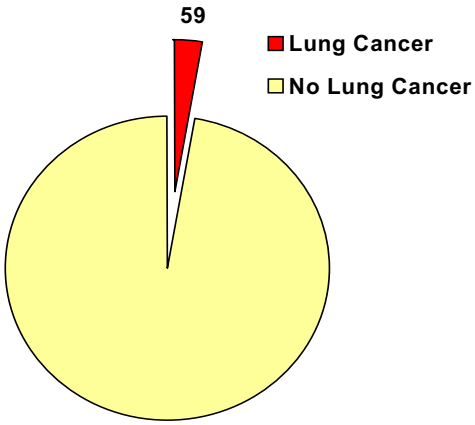

Comparison of Rates
2
1.6
1.2
0.8
0.4
0
Annual Incidence Rate...
Plot Area
A
B
Neighborhood

“TEXAS SHARPSHOOTING”

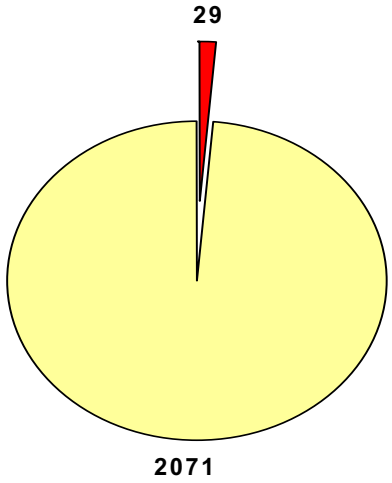


AIM, SHOOT, AND ONLY THEN--
DRAW THE TARGET

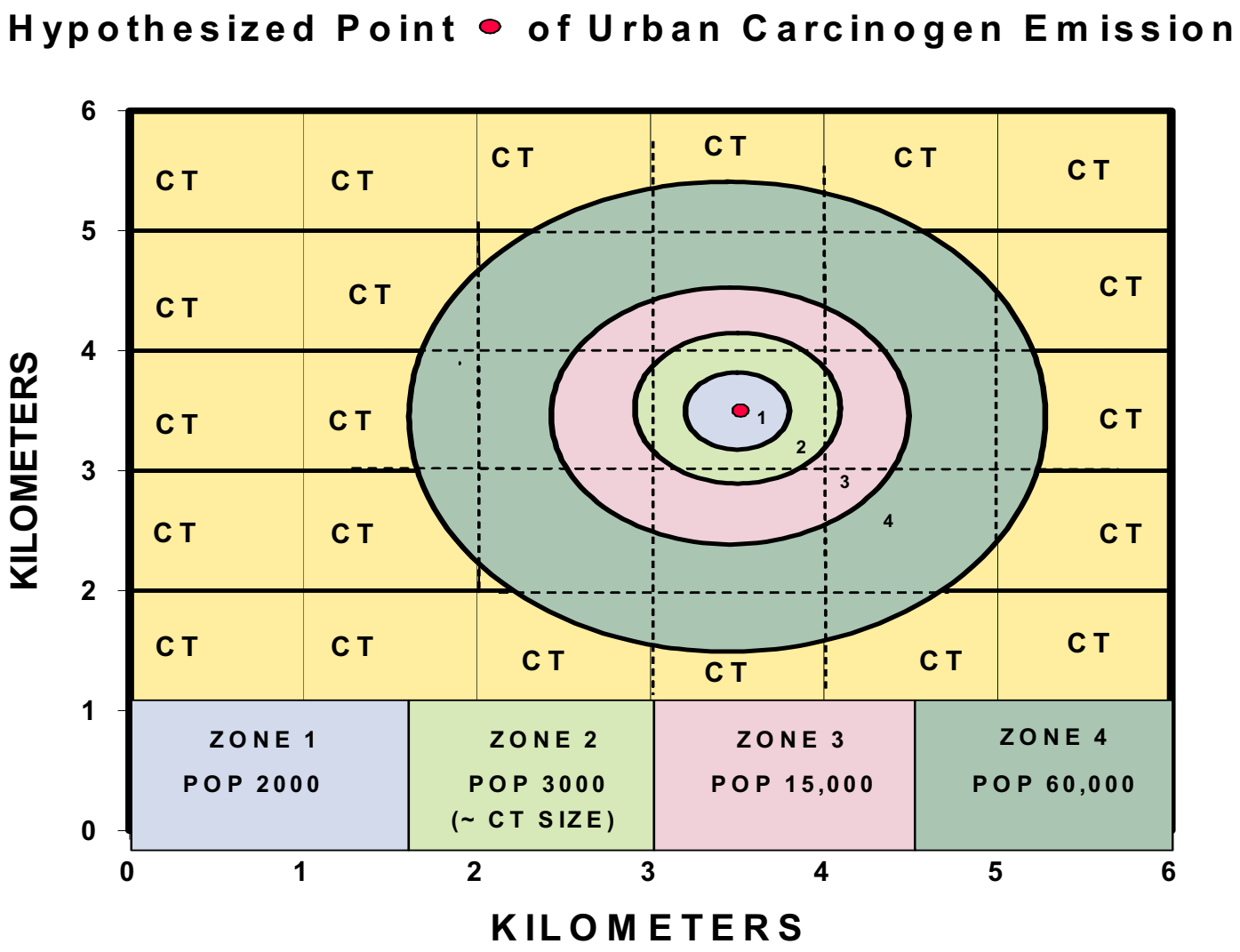
Workers with Long Term Hexavalent Chromium Exposure (180-1400 microgram/cubic meter)



Unexposed Persons



(Hayes, et al, 1972


Hypothesized Point of Urban Carcinogen Emission
KILOMETERS
KILOMETERS
0
1
2
3
4
5
6
CT
1
2
3
4
ZONE 1
POP 2000
ZONE 2
POP 3000
(~ CT SIZE)
ZONE 3
POP 15,000
ZONE 4
POP 60,000

Community Exposure to Environmental Carcinogens

Carcinogen	Job Dose	Job RR, Cumulative Risk	Highest Emission Dose	Job Dose/ Emission Dose
Hexavalent Chromium	180-1400 mcgm/CC^3	~2 ~1% cum	<0.05 mcgm/CC^3	**>3600**
Benzene	112-320 mlgm/CC^3	~ 6 ~1% cum	<0.002 mlgm/CC^3	**>56000**
Methlene Chloride	486-1648 mlgm/CC^3	~1 (no excess—Animal Carcinogen)	<0.1 mlgm/CC^3	**>4860**
Vinyl Chloride	40-312 ppm	~16 ~1% cum	<<1 ppm	**>>40**

It is more likely that environmental cancers come from exposures that are less localized but more widely disseminated, long-lasting, and cumulative.

Alternative approach

- FOCUS CONCERN ON "X CANCER" INSTEAD OF "CANCER" GENERALLY
- SHOW EACH UNIQUE PATTERN, DESCRIBE RISK FACTORS FOR EACH MALIGNANCY:
- PROVIDE SERVICE TO RESEARCHERS
- PROVIDE ASSESSMENT OF LOCAL RISK AND SHOW THAT OTHER LOCALITIES ARE AT SIMILAR RISK:
  PROVIDE SERVICE TO CITIZENS
- FORCE RECOGNITION OF THE ROLE OF CHANCE AND BIAS--ADDRESS CONCERN ABOUT "CLUSTERS"
- SEARCH FOR UNEXPECTED PATTERNS
  PROVIDE SERVICE TO COUNTY

CANCERS *in the* URBAN ENVIRONMENT

Residential Patterns in Los Angeles County

THOMAS M. MACK

RATIONALE

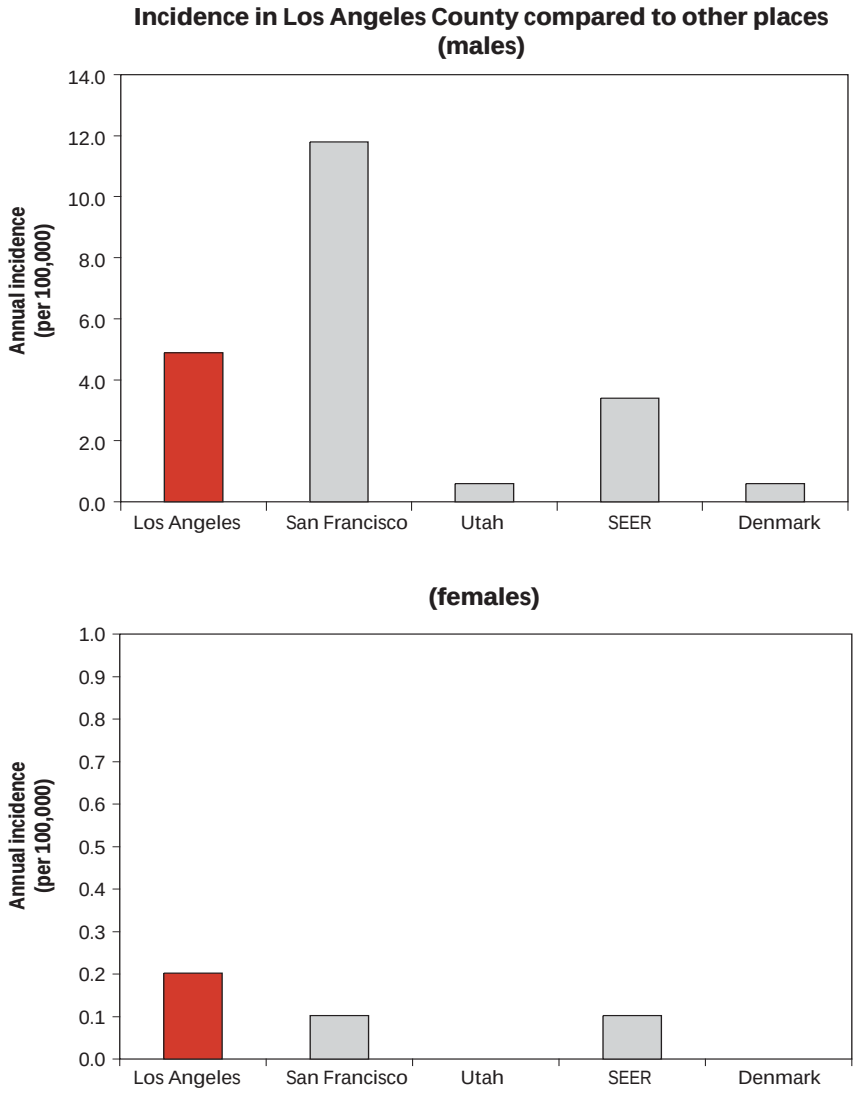
- **URBAN CONTRASTS SHARPER THAN NATIONAL ONES**
  - **EXPOSURES**
  - **LIFESTYLES AND ETHNICITY**
- **LA IS THE MOST HETEROGENEOUS COUNTY**
- **> 30 YEARS OF UNIFORM REGISTRY EXPERIENCE**
- **TAKE ADVANTAGE : PERCEPTION OF PERSONAL RISK COMMANDS ATTENTION**

Malignancies according to Annual Incidence /100,000

- >75: M Lung, Prostate
  F Breast
- 25-74: M Colon
  F Lung, Colon
- 15-24: M Rectum, Melanoma, Oropharynx, Bladder, NHL
  F Endometrium, Ovary
- 10-14: M Stomach, Pancreas, Kidney
  F Rectum, Melanoma, Cervix, NHL
- 5-9: M Esophagus, Larynx, Liver, Testis, Brain, Myeloma
  F Oropharynx, Stomach, Pancreas, Bladder, Kidney, Thyroid
- 2-4: M Mesothelioma, Sarcoma, Kaposi Sarcoma, Thyroid, Hodgkins lymphoma, ALL,CLL
  F Esophagus, Liver, Sarcoma, Brain, Myeloma, Gallbladder, Hodgkin Lymphoma, Anus, CLL
- 1: M Small Bowel, Anus, Gallbladder, Biliary, Salivary Gland, Osteosarcoma, Breast
  F Small Bowel, Biliary, Larynx, ALL
- <1: M All Others
- F All Others

KAPOSI SARCOMA

mack-1-KAP.eps



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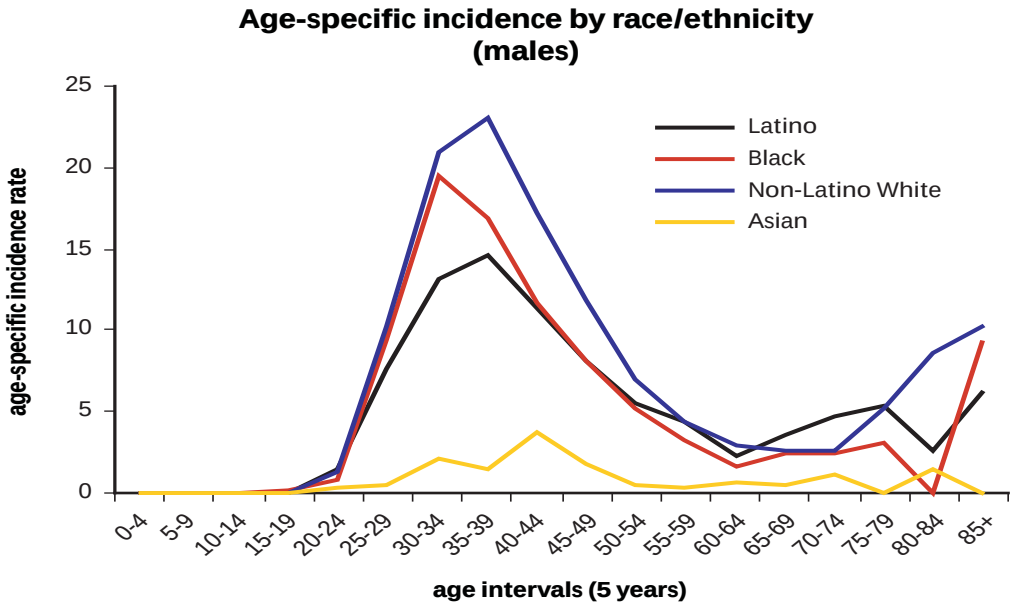
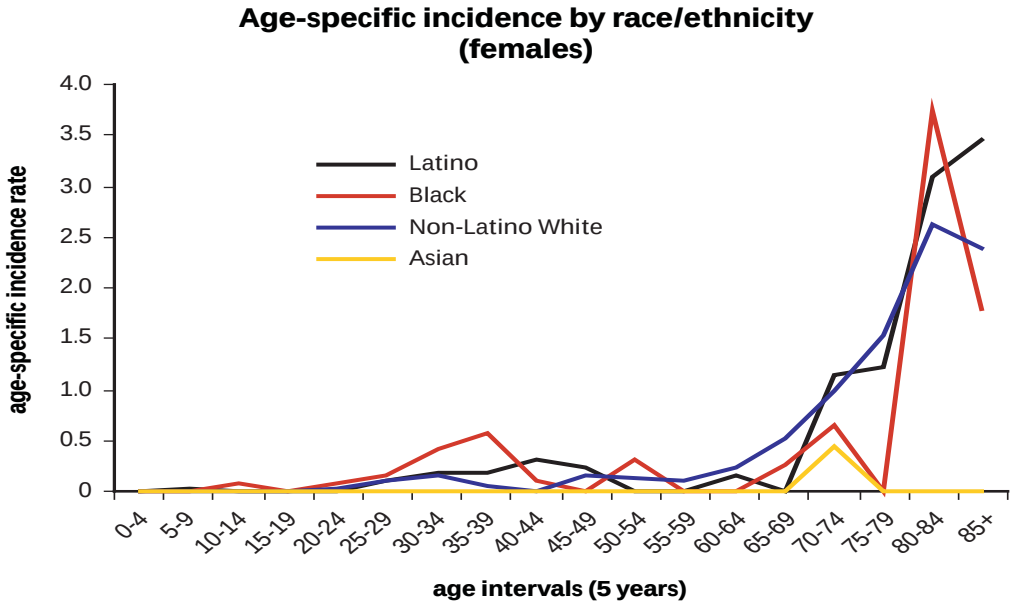
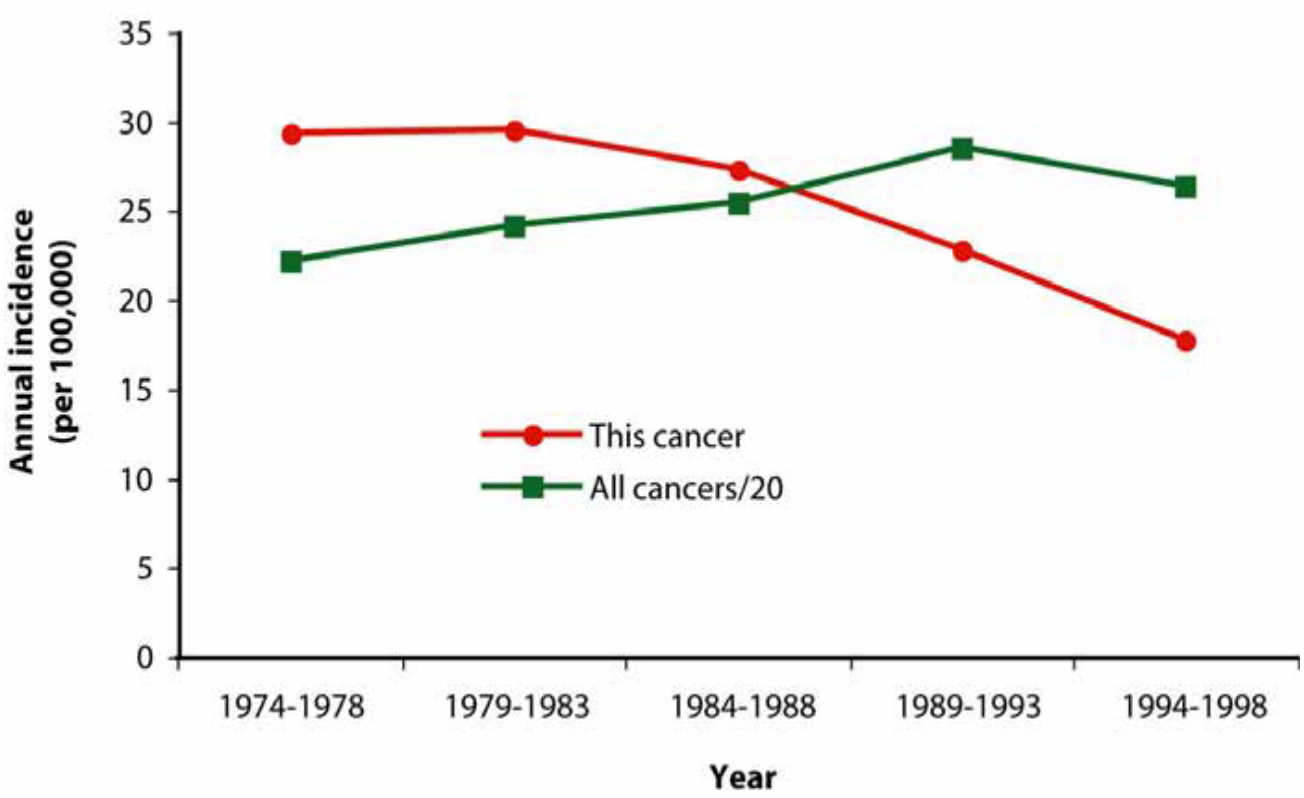
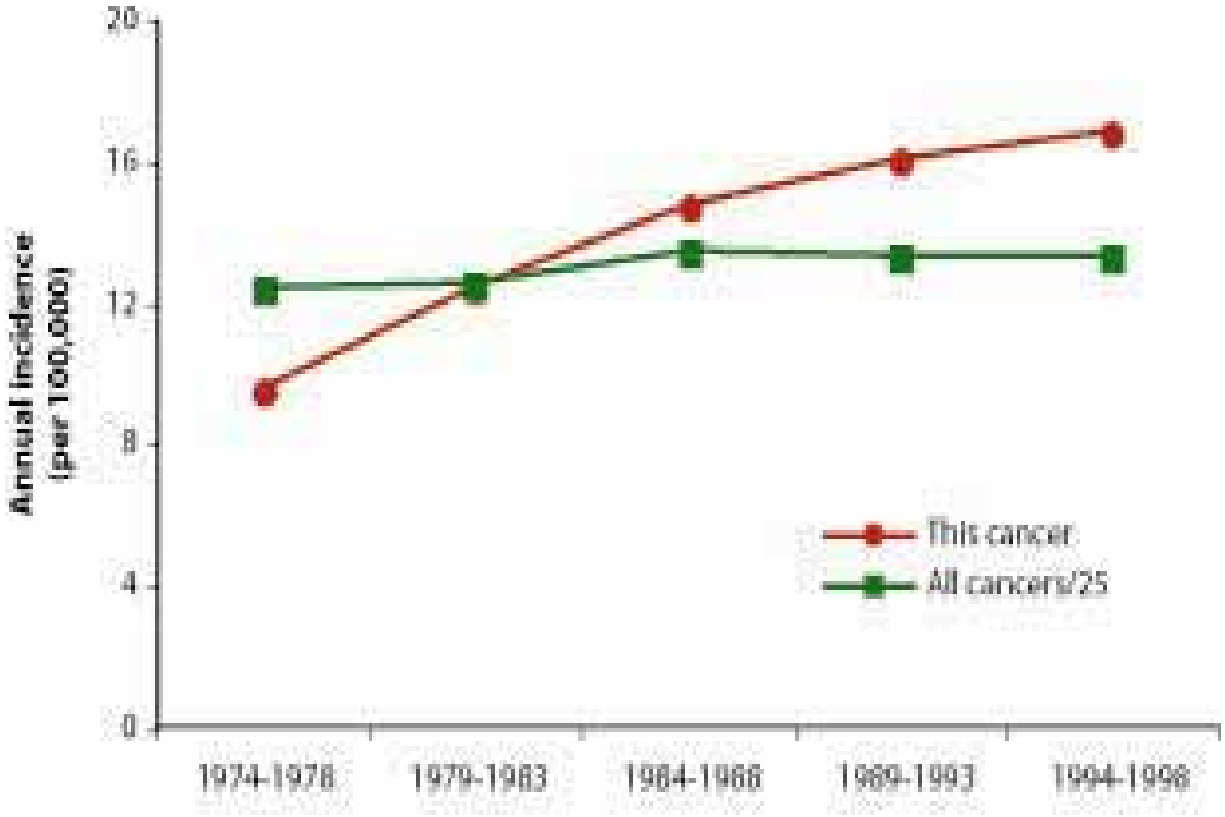




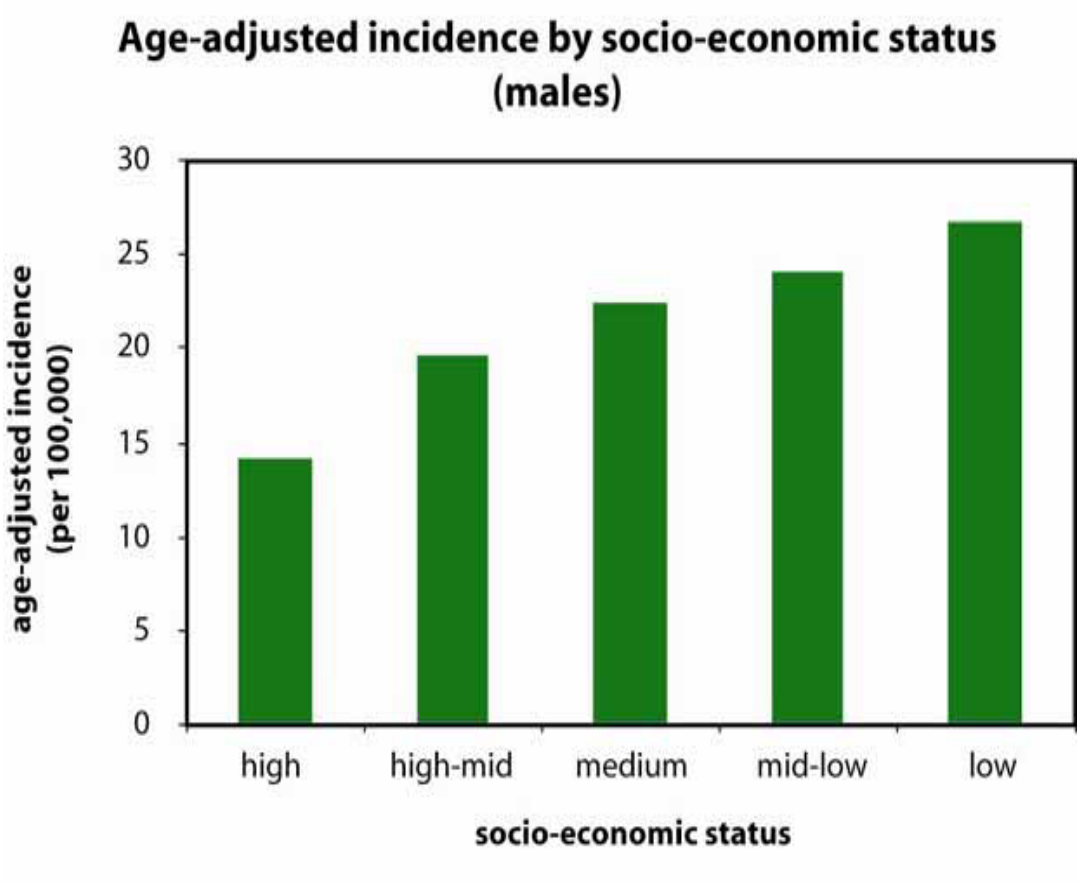
SQUAMOUS CELL LUNG CARCINOMA
MALES: TREND OVER TIME



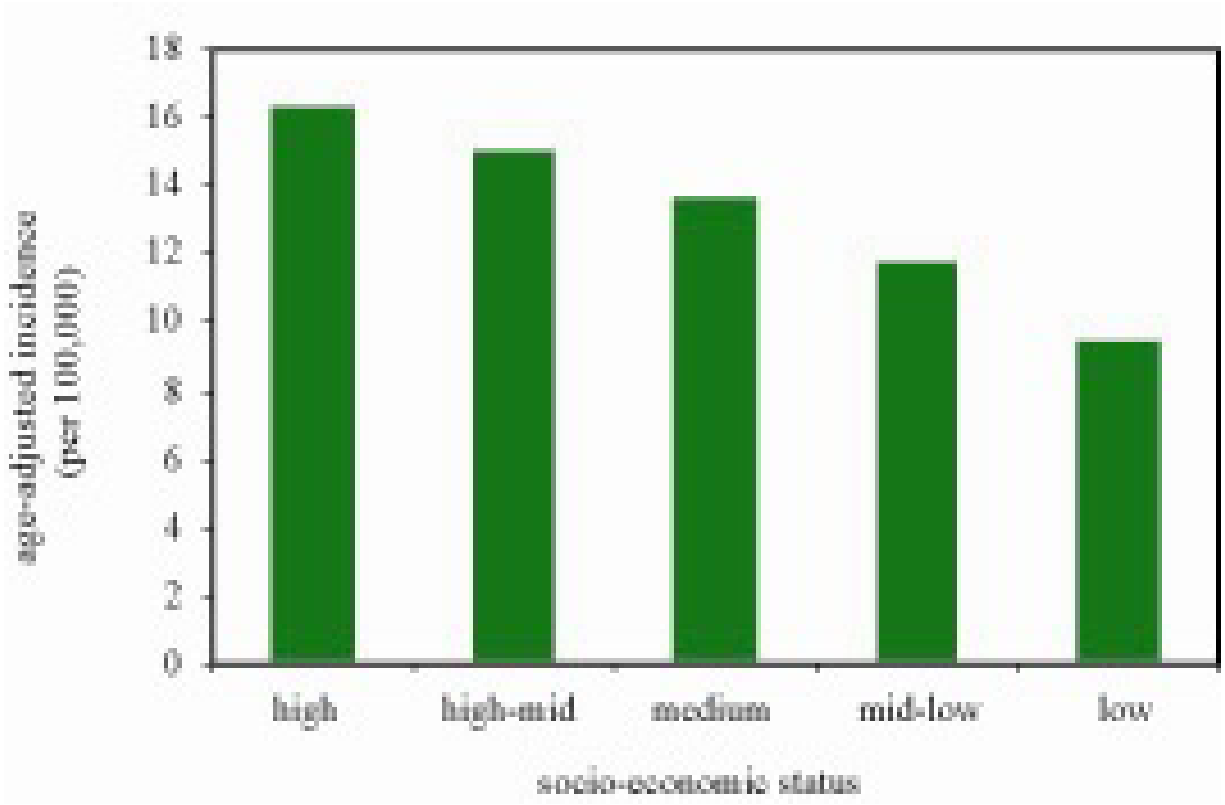
ADENOCARCINOMA OF THE LUNG
FEMALES: TREND OVER TIME



SQUAMOUS CELL LUNG CARCINOMA



ADENOCARCINOMA OF THE LUNG
AGE-ADJUSTED INCIDENCE, FEMALES
BY SOCIO-ECONOMIC STATUS



RESOURCES AND CHOICES

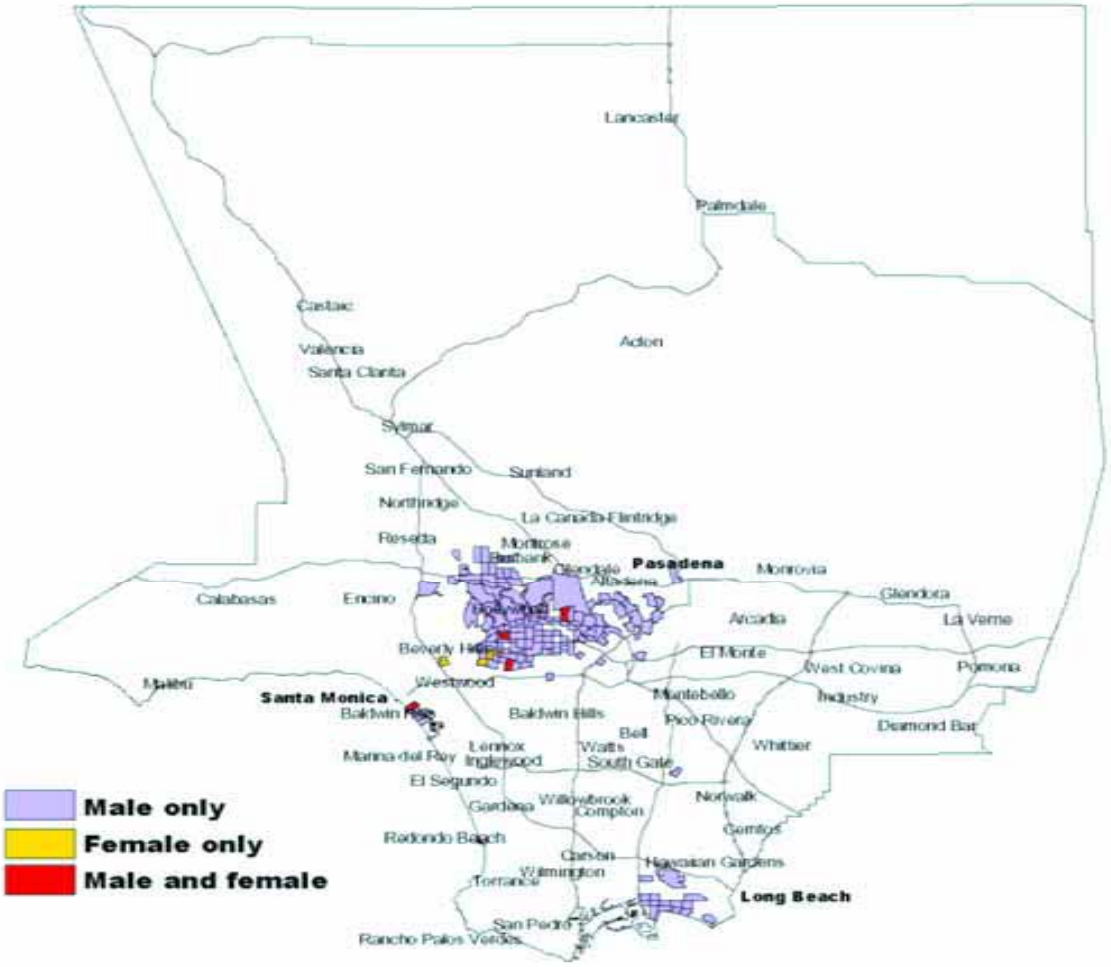
- **USC-LA CSP RECORDS**

  - **72 ENTITIES, 12 COMBINATIONS, 766,000+ CASES**
- **BY AGE, SEX, RACE, DATE, SES, ADDRESS**

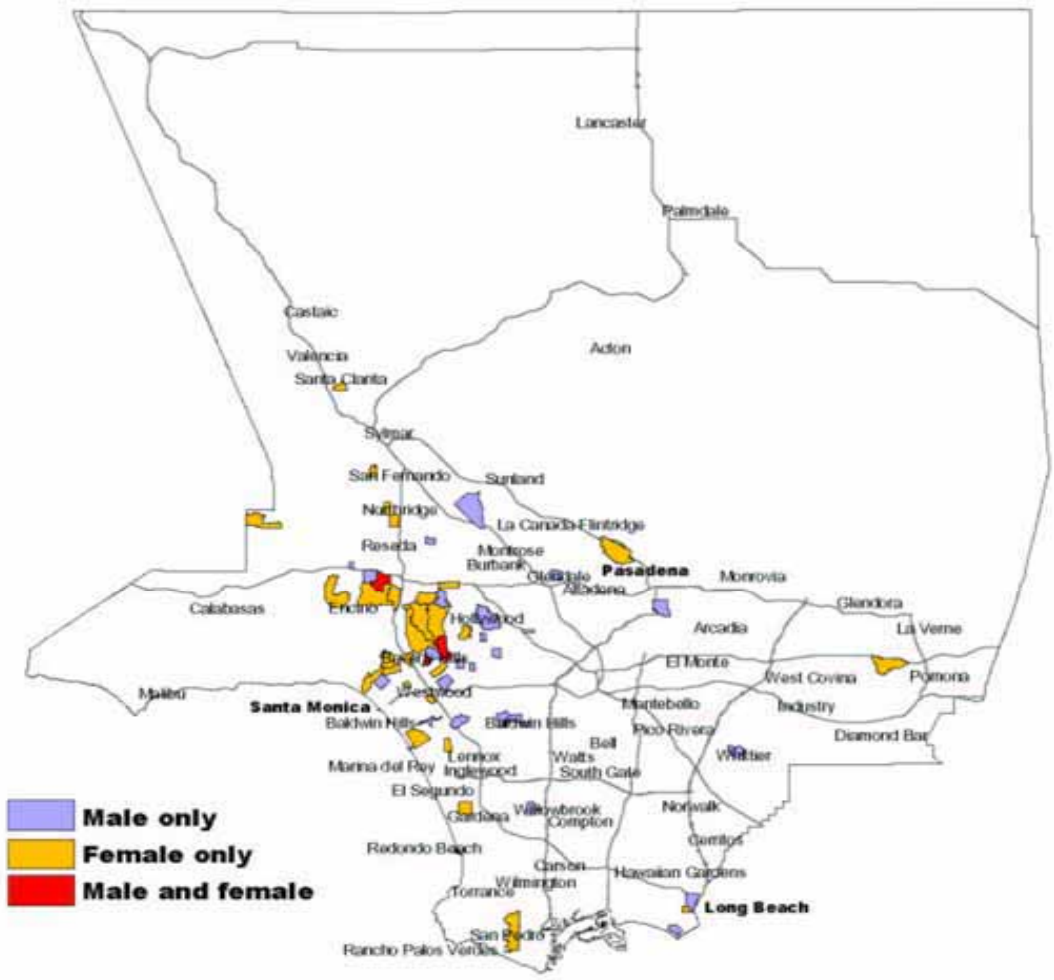
- **ARBITRARY DEFINITION OF HIGH RISK**
  - **> 3 CASES (1 CASE PER DECADE)**
  - **At least a 50% increase over county average**

  - **SIGNIFICANTLY EXCEEDS EXPECTED**

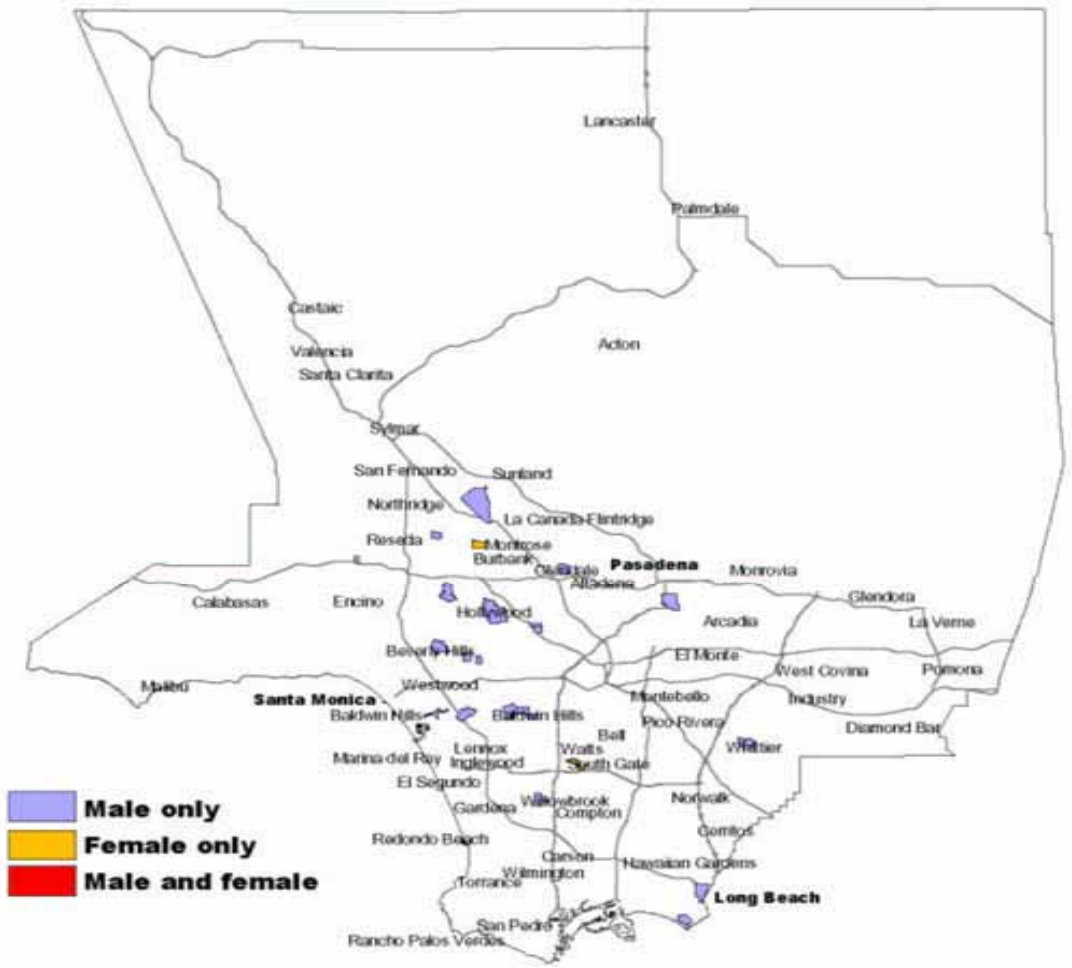
KAPOSI SARCOMA



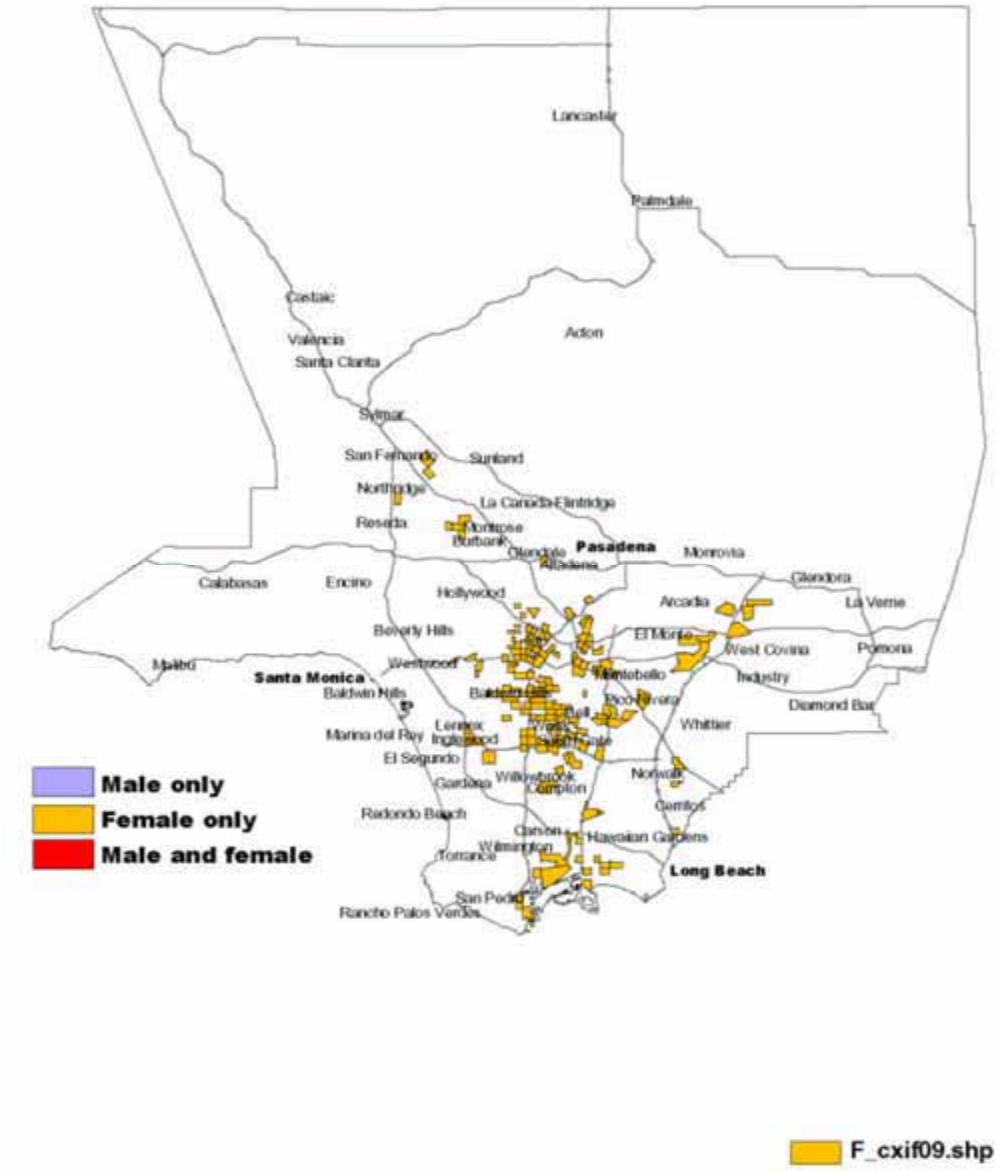
CARCINOMA OF THE BREAST



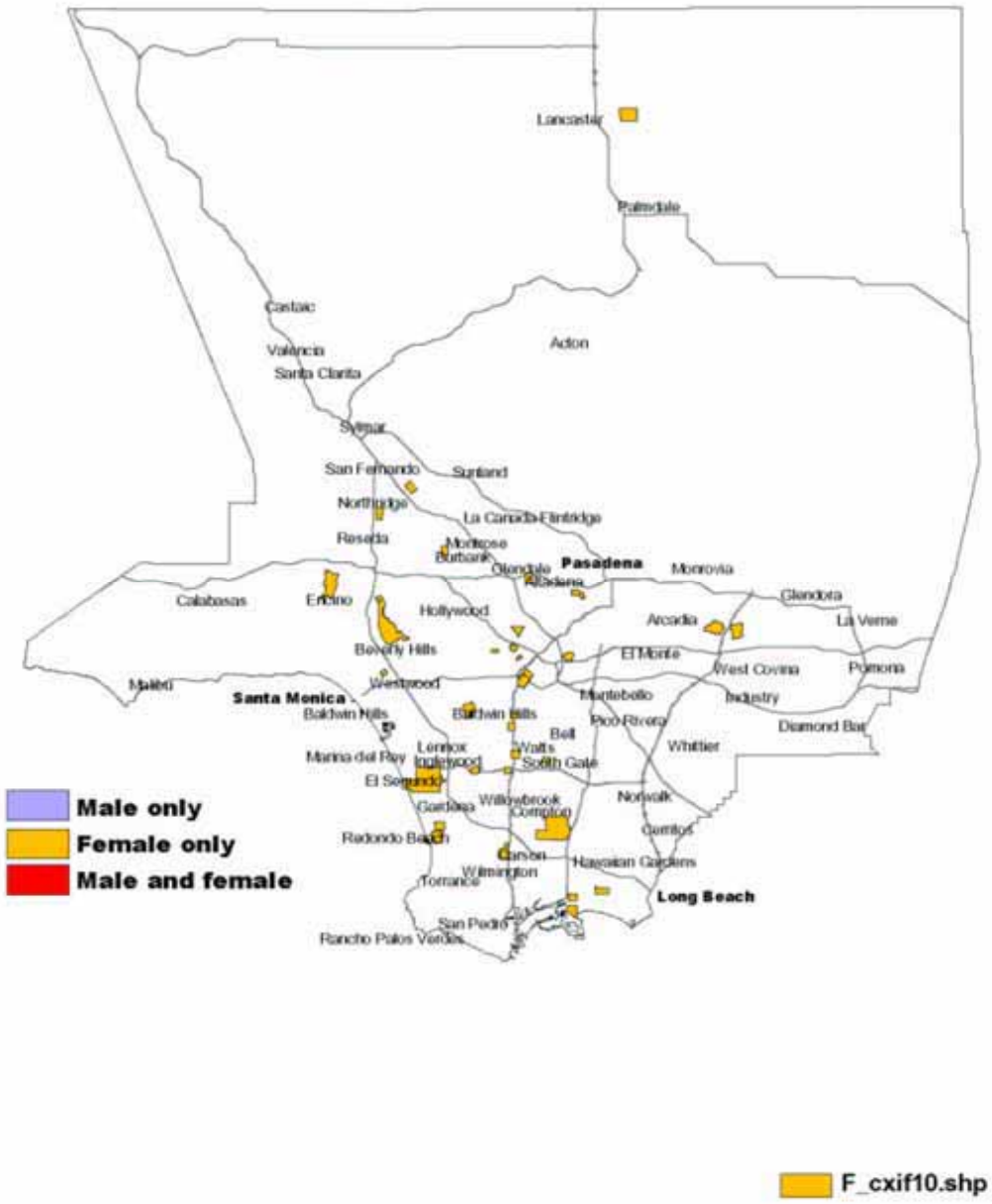
CARCINOMA OF THE BREAST



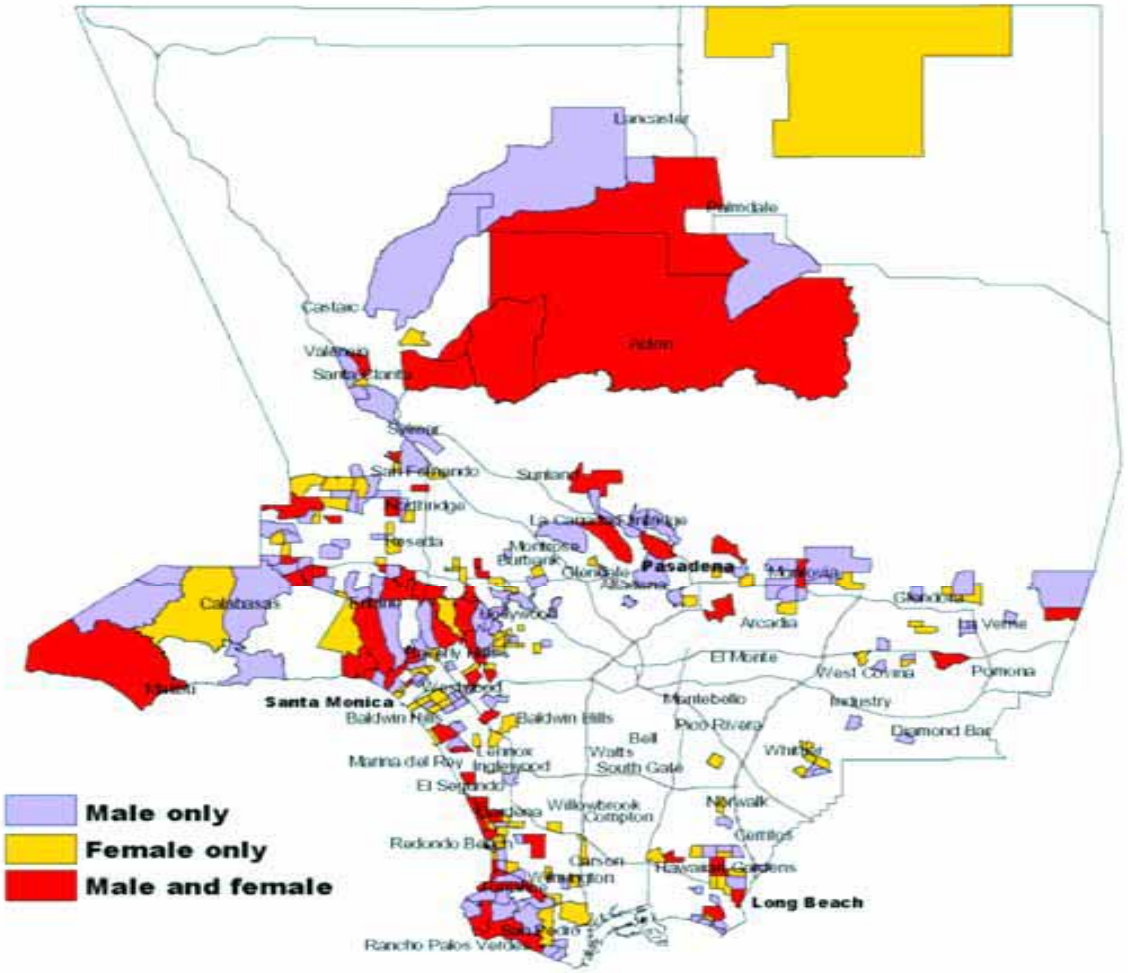
CARCINOMA OF THE CERVIX



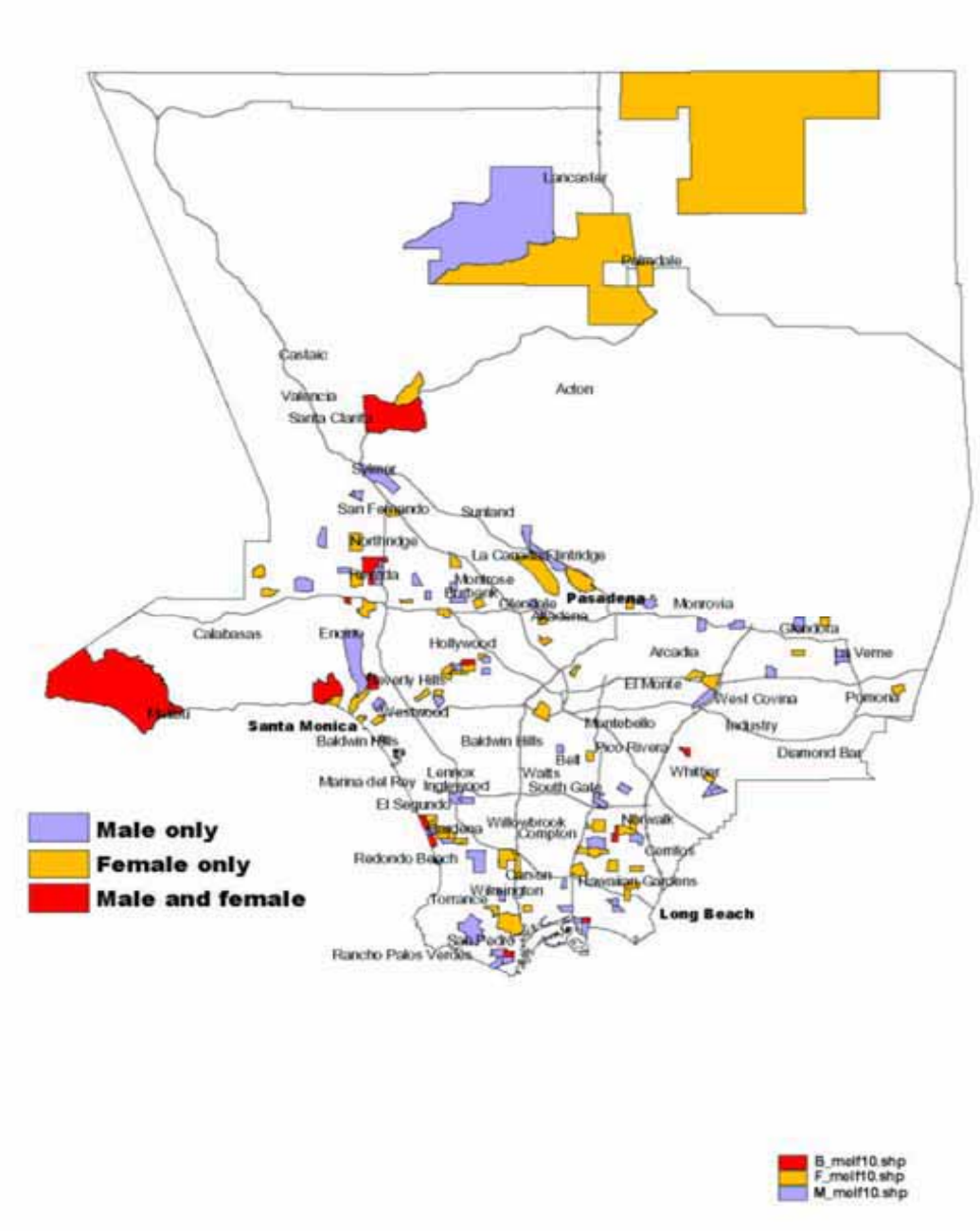
CARCINOMA OF THE CERVIX



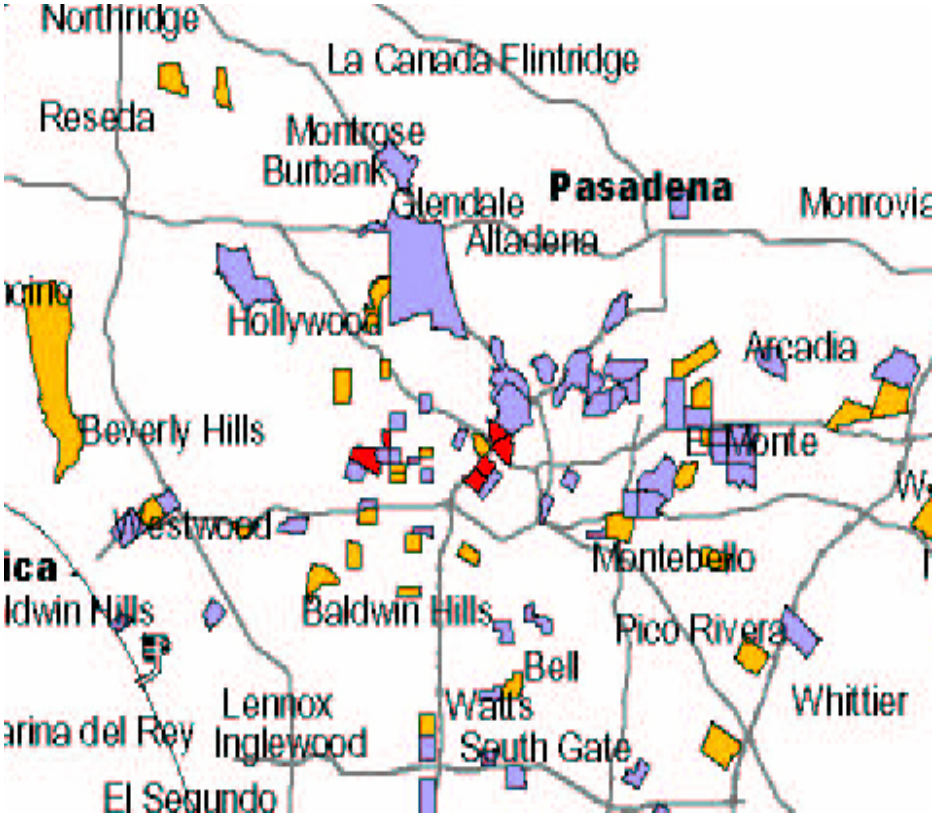
MALIGNANT MELANOMA



MALIGNANT MELANOMA

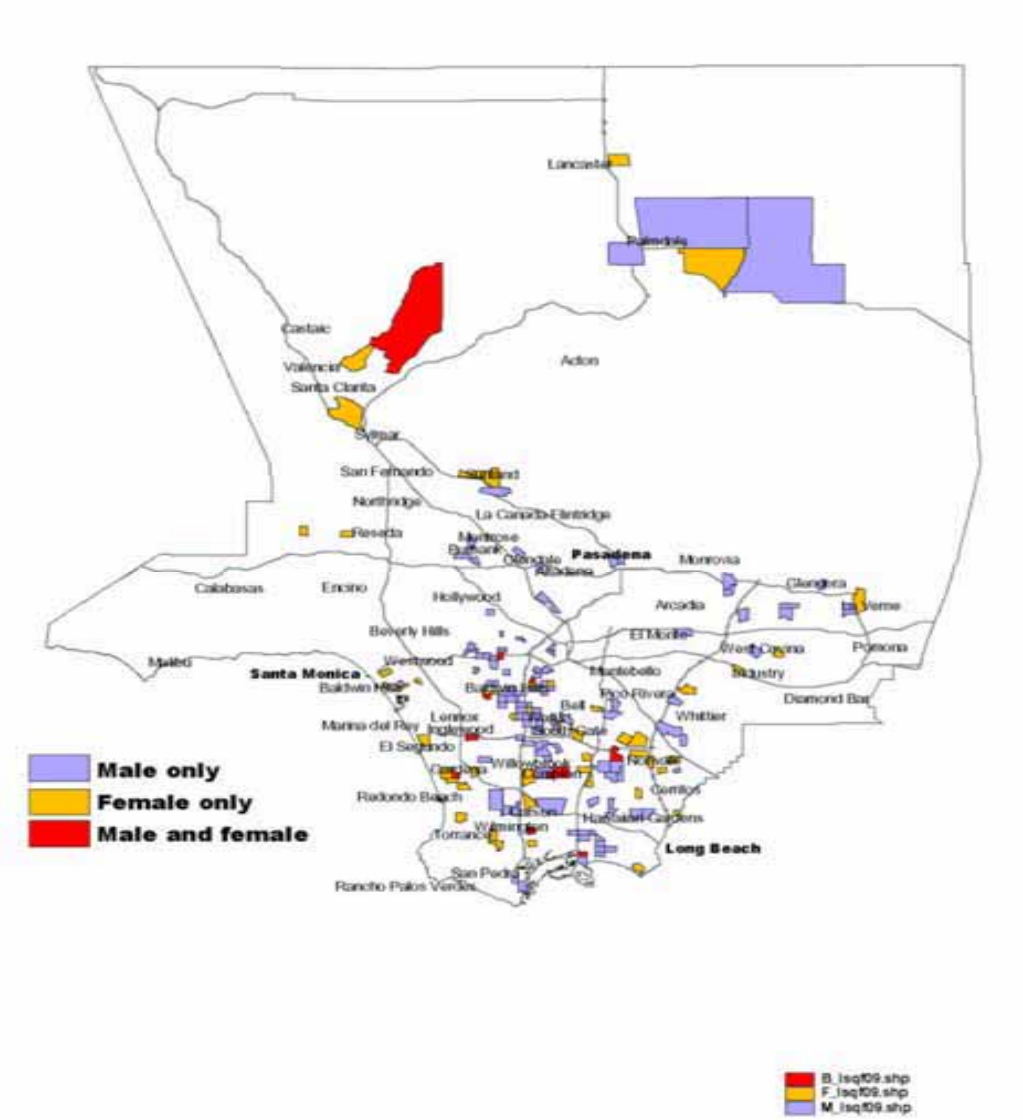


HEPATOCELLULAR CARCINOMA

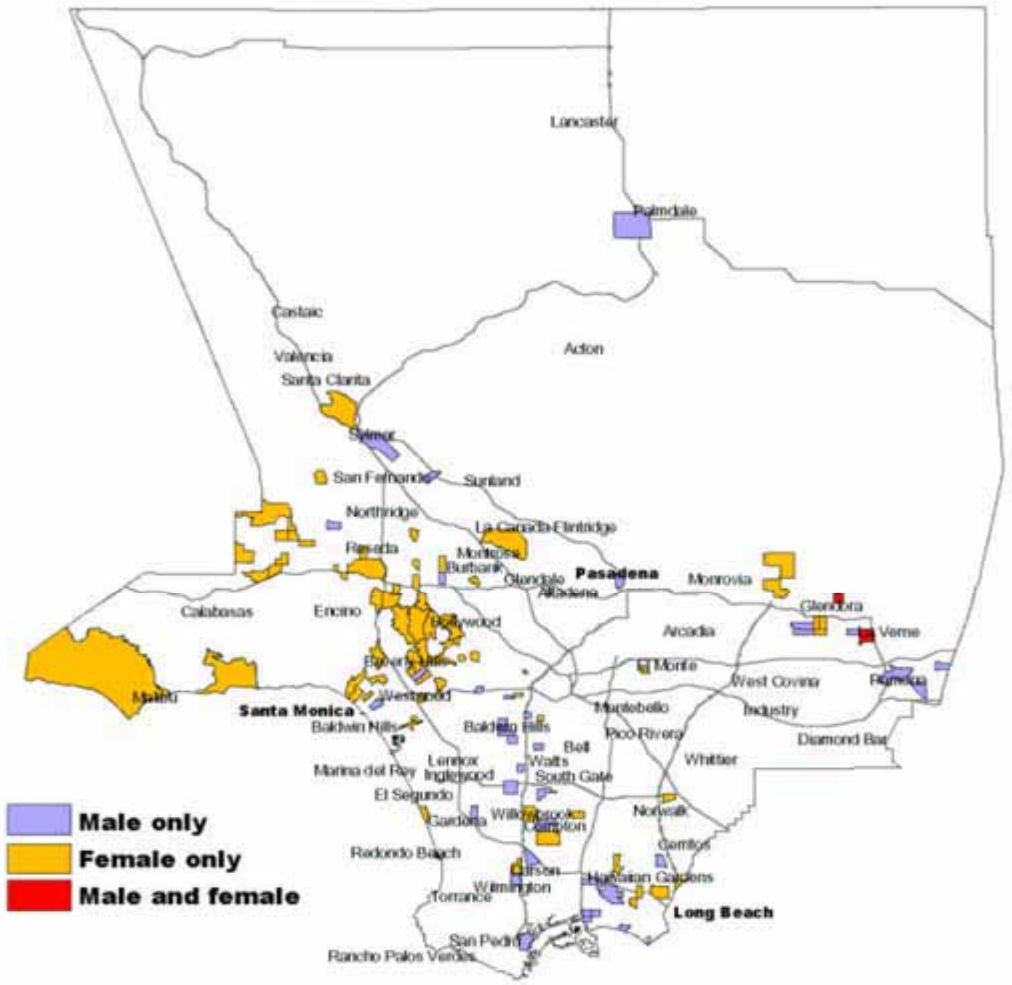


MALIGNANT MESOTHELIOMA

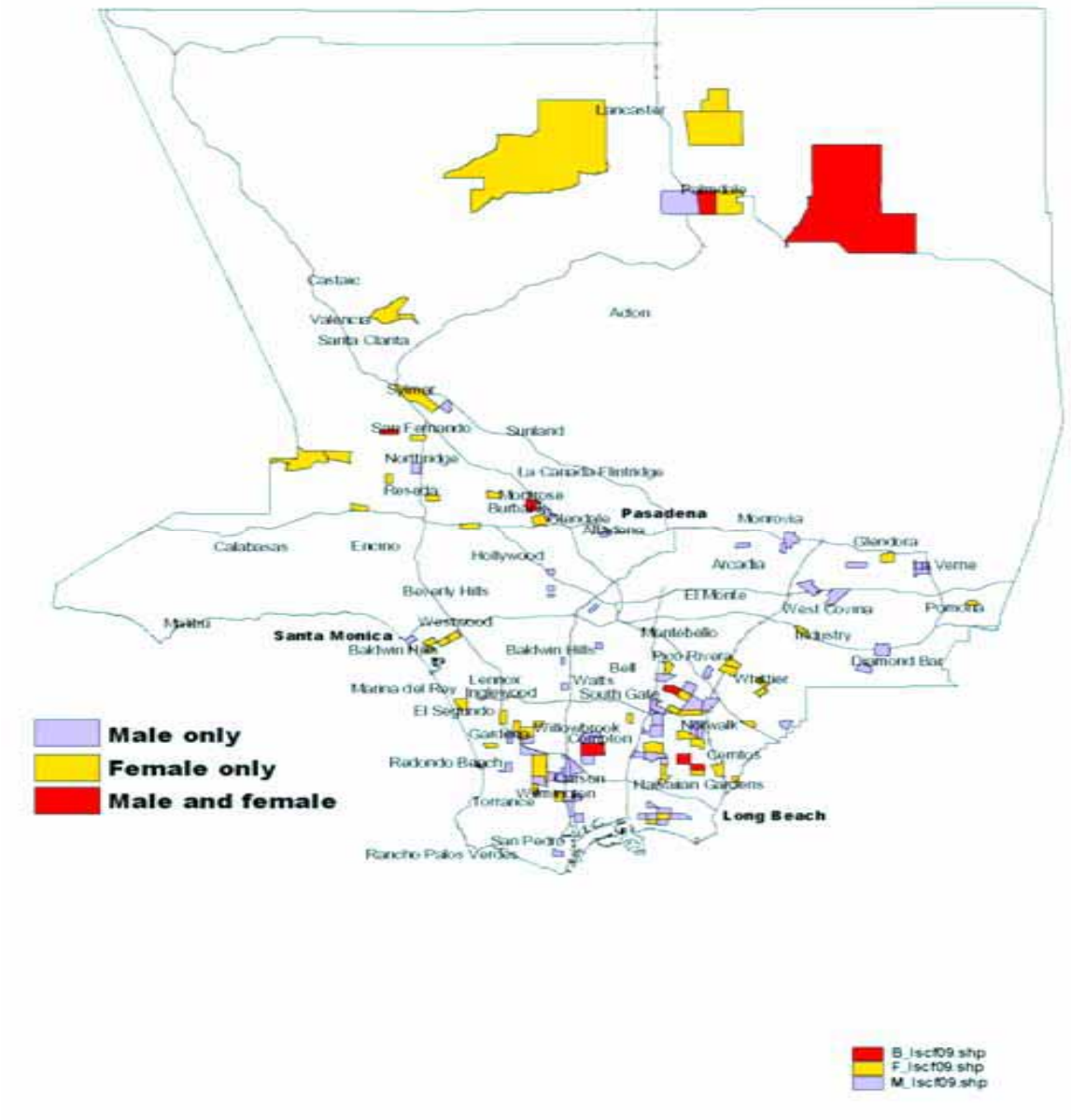
SQUAMOUS CELL LUNG CA



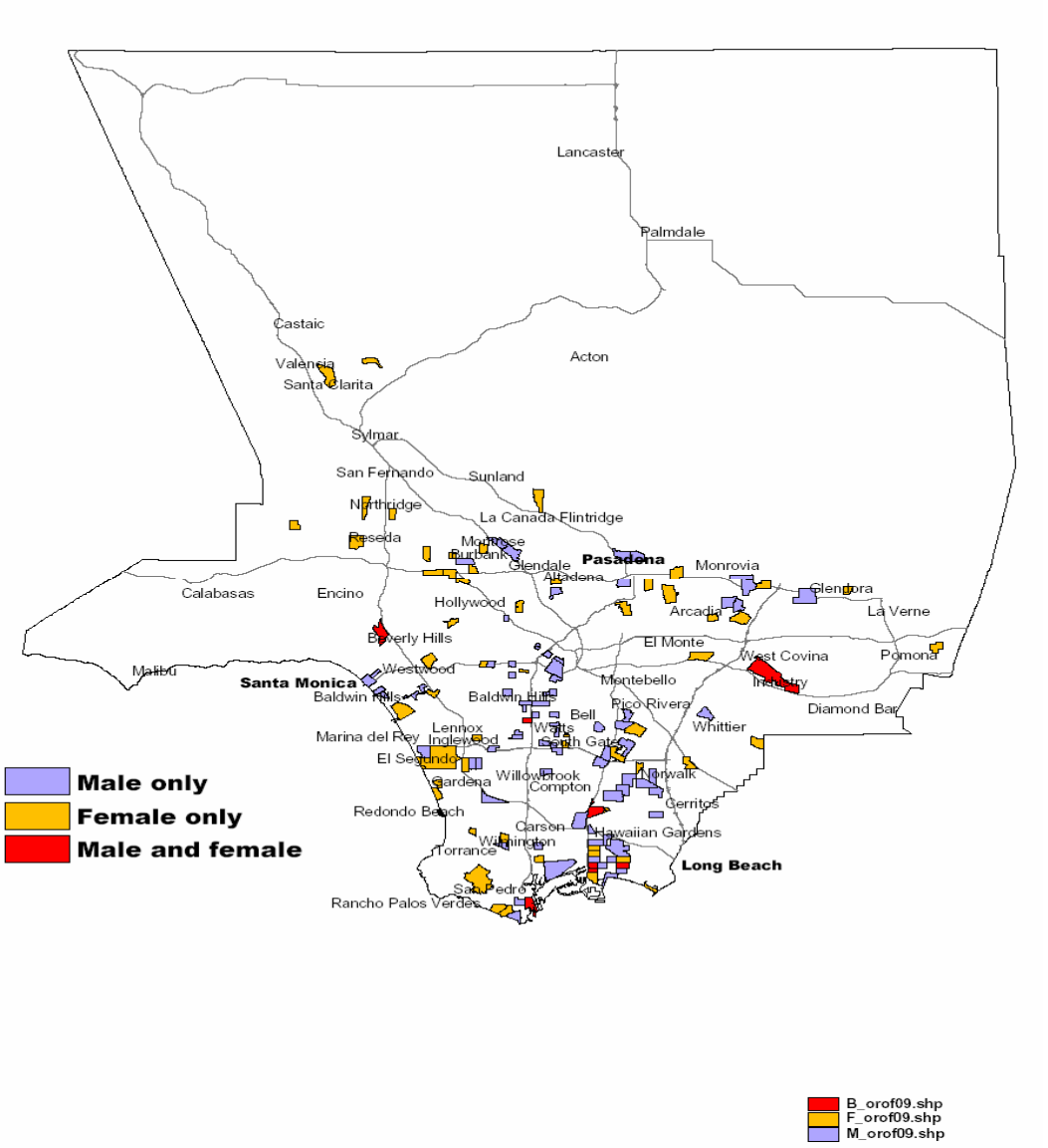
LUNG ADENOCARCINOMA



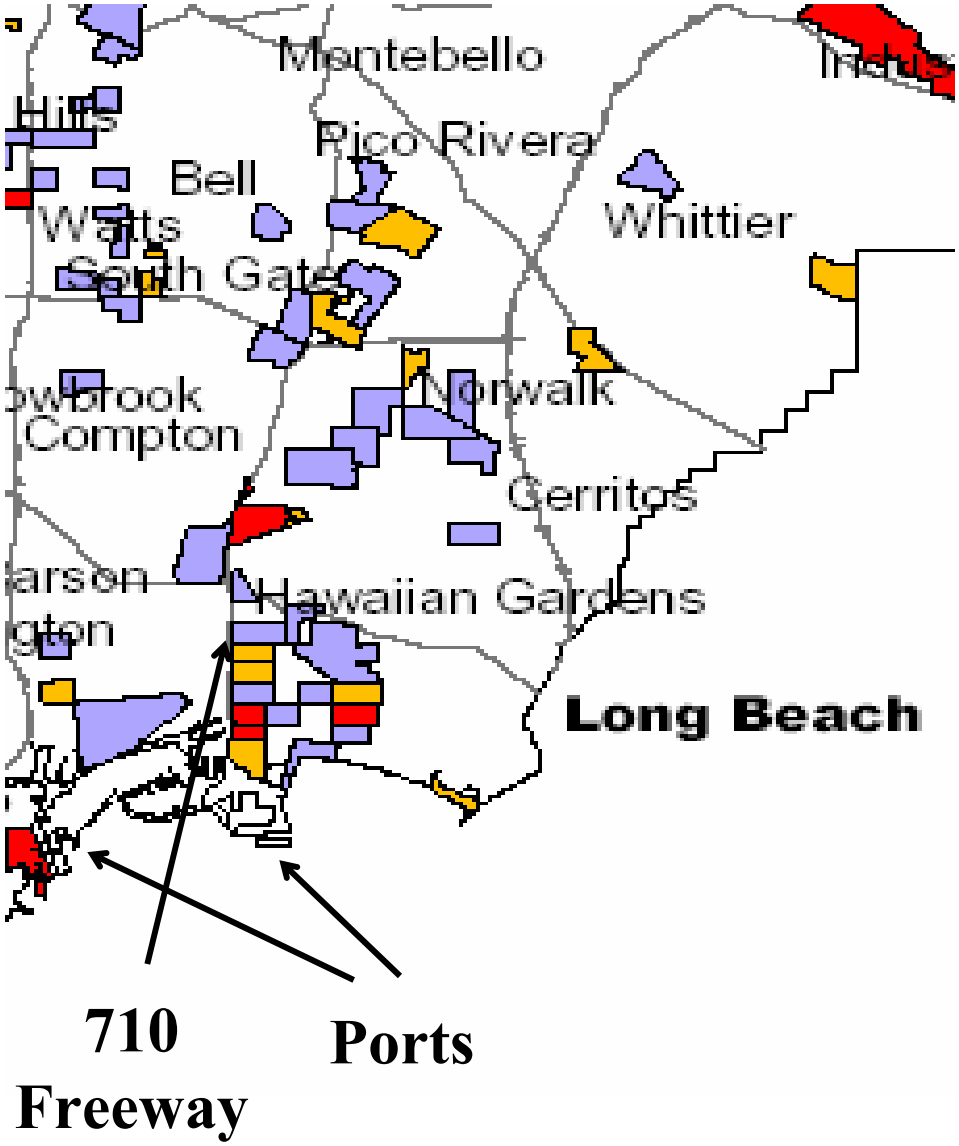
SMALL CELL LUNG CA



Carcinoma of the Oropharynx (known causes: smoking/alcohol)



Carcinoma of the Oropharynx

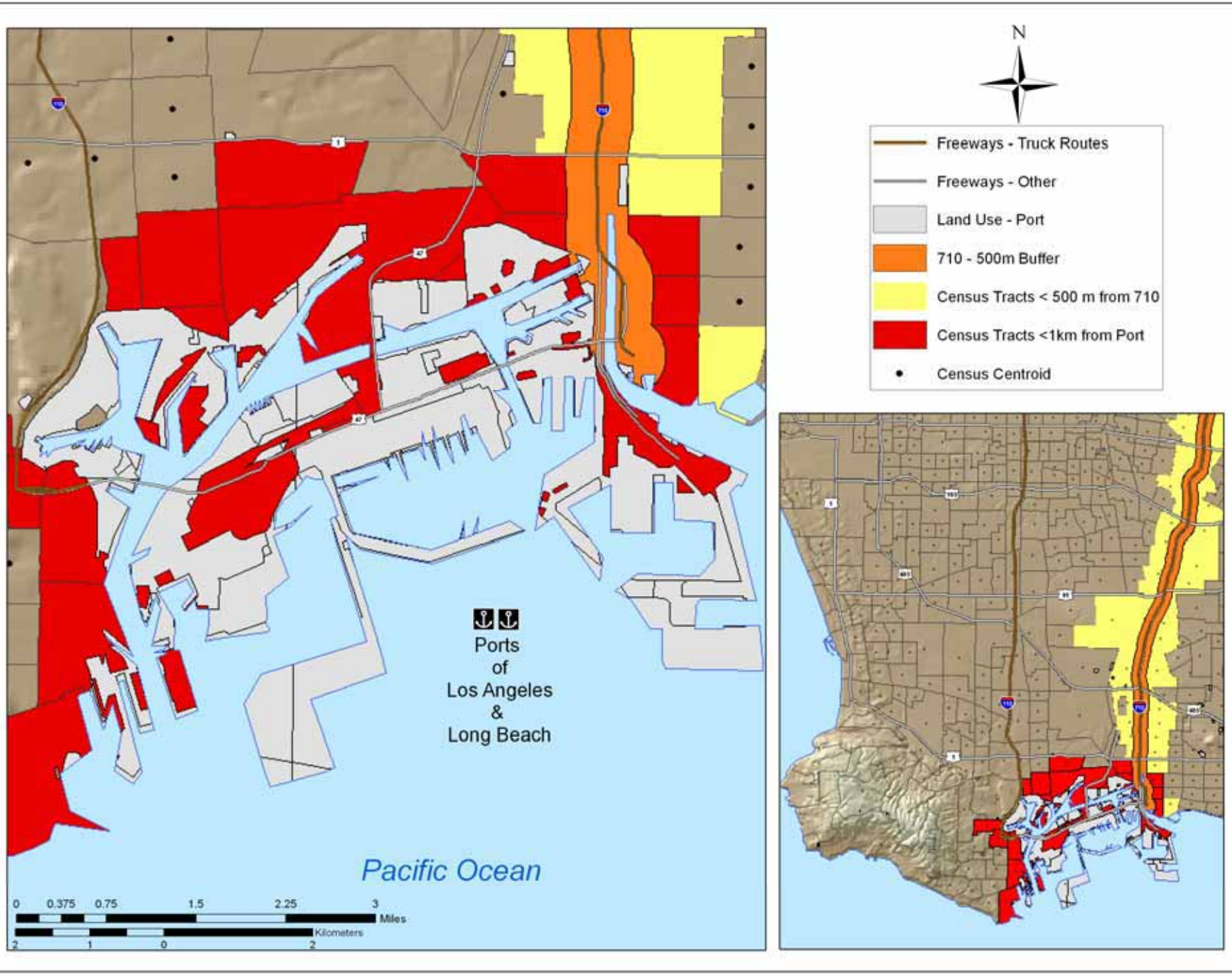


Malignancies known to be caused by alcohol/tobacco

Mouth/Tongue Larynx Esophagus

Malignancies known or suspected to be caused by particulate pollution

Lung (all histologies) Pharynx


N
Freeways - Truck Routes
Freeways - Other
Land Use - Port
710 - 500m Buffer
Census Tracts < 500 m from 710
Census Tracts <1km from Port
Census Centroid
Ports
of
Los Angeles
&
Long Beach
Pacific Ocean
0 0.375 0.75 1.5 2.25 3
Miles
Kilometers
2 1 0 2

Relative Risk of Tract Residents according to Proximity of Exposure

Malignancy	Sex	Referent	RR :Tracts East of 710 Freeway	RR :Tracts Adjacent to a Port
Lung (Squam.)	M/F	1.0/1.0	1.2*/1.1	
Lung (Sm. Cl.)	M/F	1.0/1.0	1.3*/1.3*	
Larynx	M/F	1.0/1.0	1.1/0.9	
Esophagus	M/F	1.0/1.0	0.7/0.8	
Mouth/Tongue	M/F	1.0/1.0	1.1/ 1.3*	
Pharynx	M/F	1.0/1.0	1.2/1.1	

*P<0.05

Relative Risk of Tract Residents according to Proximity of Exposure

Malignancy	Sex	Referent	RR :Tracts East of 710 Freeway	RR :Tracts Adjacent to a Port
Lung (Squam.)	M/F	1.0/1.0		1.1/ 1.3*
Lung (Sm. Cl.)	M/F	1.0/1.0		1.3*/1.4*
Larynx	M/F	1.0/1.0		1.3*/0.9
Esophagus	M/F	1.0/1.0		1.1/1.0
Mouth/Tongue	M/F	1.0/1.0		1.5*/1.6*
Pharynx	M/F	1.0/1.0		1.3*/1.4*

*P<0.05

Future Directions

- **Initiate particulate measurements in tracts**
- **Case-control and case-case studies: compare cases of pharyngeal cancer in these tracts to healthy persons and cases elsewhere**
- **Stimulate observation at other port locations**
- **Explore other unexpected non-random**